

SOME FOSSIL SEEDS FROM THE UPPER PALAEOZOIC ROCKS OF
THE WERRIE BASIN, N.S.W.

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(Plate xix.)

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The seeds described in this paper were collected by Mr. S. W. Carey during the course of his geological investigation of the Werrie Basin (Carey, 1934). They include specimens from three distinct Series, viz.: (a) Kuttung Series, (b) Greta Coal Measures, (c) Newcastle Coal Measures.

The seeds from the Kuttung Series were collected from several horizons within the Glacial Stage of that Series and represent a variety of types. This variety of seed types is interesting in view of the limited number of species of which the vegetative organs are known in the Kuttung Series. From the upper part of this Series (part of Volcanic Stage, and the Glacial Stage) the following plants have been described:

Archaeocalamites radiatus, *Lepidodendron* sp., *Rhacopteris ovata*, *R. intermedia*, *R. Roemeri*, *R. septentrionalis*, *R. Wilkinsoni*, ?*Noeggerathia* sp., *Cardiopteris* cf. *frondosa*, *Sphenopteris Clarkei*, ?*Sphenopteridium cuneatum*, *Adiantites* (?) *robustus* and *Rhacophyllum diversiforme*.

These plants have been recorded from the Upper Kuttung Series in areas south of the region investigated by Mr. Carey. I have no record of the extent of the collections of vegetative organs made by Mr. Carey from the Kuttung Series in the Werrie Basin.

Attention has been drawn in other parts of the world to the numerical excess of seeds over vegetative organs in Upper Palaeozoic rocks. It would appear that collectors in the past have paid little attention to the seeds which are almost certainly obtainable in the Kuttung Series in association with the vegetative remains. Mr. Carey has shown that seeds are quite abundant on a number of horizons in the Werrie Basin and future collecting in other areas may be expected to reveal the presence of a variety of seeds. The seeds are preserved as impressions, and little information is available regarding their structure. It is, however, worth while recording their occurrence as a guide to future collectors.

(a) *Seeds from the Upper Kuttung Series.*

TRIGONOCARPUS (?) OVOIDEUS, n. sp. Pl. xix, fig. 1.

Impressions of ovoid seeds, broadest near base, gradually narrowing towards apex where there is a short narrow projection. The impressions are 7-8.5 mm. long by 5 mm. broad, the apical projection 0.5-1.0 mm. long. There are some fine vertical striations, and indication of one or two vertical wrinkles. The edge (for a breadth of about one-third of a millimetre) appears solid.

.There is insufficient evidence for any accurate determination. It is suggested that the specimens may represent impressions of the sclerotesta of *Trigonocarpus*. If this interpretation be correct, no trace of the sarcotesta is to be seen in either of the specimens. They bear some resemblance to Arber's figure (1914, Text-fig. 1) of *Trigonocarpus clavatus* (Sternberg), and also to Halle's figures (1927, Pl. 54, figs. 23, 24) of *T. (?) Norinii* from the Lower Shihhotse Series (basal Permian) of Shansi, though our specimens are somewhat smaller than the latter.

The figured specimen is No. 2022 in the collection of the Geology Department, University of Sydney.

TRIGONOCARPUS (?) ELLIPTICUS, n. sp. Pl. xix, fig. 2.

Small, rounded, elongate seeds, 8-8.5 mm. by 4-4.5 mm. One specimen (No. 2024) shows two rather prominent ridges extending from the apex to about half-way down the seed; there are also faint indications of fine vertical striation. There is a thin outer carbonaceous layer, and, near the apex, some slight indication of the existence of a wing.

These seeds perhaps do not give sufficient information even for generic determination. They are obviously not platyspermic types and so they may not be referred to the *Samaropsis* type of seed. They show some resemblance to those described below as *Carpolithus striatus*.

The figured specimen is No. 2024 in the collection of the Geology Department, University of Sydney.

SAMAROPSIS (?) OVALIS, n. sp. Pl. xix, fig. 3.

Small, ovate to almost circular impressions, to 10 mm. long by 7 mm. broad, showing no structure beyond a division into three sections. The central portion, which is about 3 to 3.5 mm. wide, may represent the nucule, and the outer portions the wings, of a species of *Samaropsis*. The apex of the impression is shallowly emarginate.

These seeds are generally similar to some examples of *Samaropsis Seiwasi* (White) from Brazil (cf. Seward, 1917, p. 350, fig. 502F), and also to the specimen referred by Halle (1927, Pl. 54, fig. 21) to *Samaropsis?* sp. from the Upper Shihhotse Series (Lower Permian) of Shansi. Some general resemblance may also be noted to the specimens figured by Arber (1914, Pl. vii, fig. 41) as *Radiospermum ornatum*, which Seward (1917, p. 323) suggested should be transferred to *Polygonocarpus*.

The figured specimen is No. 2028 in the collection of the Geology Department, University of Sydney.

SAMAROPSIS cf. BARCELLOSA White. Pl. xix, fig. 4.

Nucule almost circular, about 4 mm. diameter, completely surrounded by comparatively broad wing, widening at apex. The dimensions, including wing, are about 8 mm. by 6 mm.

This seed is distinct from any of the others herein described; it may be compared with *Samaropsis barcellosa*, another species described by David White from the Permo-Carboniferous of Brazil (cf. Seward, 1917, p. 350, fig. 502G). It also shows some resemblance to specimens described as *Samaropsis (?)* sp. by Feistmantel from the Lower Gondwanas (Karharbari) of India.

The figured specimen is No. 2030 in the collection of the Geology Department, University of Sydney.

SAMAROPSIS MILLERI (Feistmantel). Pl. xix, fig. 7.

A number of ovate specimens, about 20 mm. by 12 mm., appear to be identical with the nucule of *Samaropsis Milleri* as figured by Feistmantel and by Seward (1917, p. 353, fig. 504). In our specimens there is, however, no trace of the wing, but this may have been completely destroyed before fossilization.

The figured specimen is No. 2031 in the collection of the Geology Department, University of Sydney.

CARPOLITHUS STRIATUS, n. sp. Pl. xix, fig. 5.

Rounded, ovate seed, 6-7 mm. by 4 mm., with numerous fine vertical striations, which appear to spread from a single strand entering the seed from a narrow basal projection. There is no indication of a wing, though there is a thin carbonaceous film on the outside at the base.

It is difficult to place these seeds. They bear some resemblance to the nucule in such forms as *Samaropsis barcellosa* White. They may be referred to *Carpolithus* in view of the small amount of information available.

The figured specimen is No. 2032 in the collection of the Geology Department, University of Sydney.

CORDAICARPUS (?) OVATUS, n. sp. Pl. xix, fig. 8.

Flattened impressions, ovate to almost circular, 6.5 mm. by 5 mm., with distinctly pointed apex; sometimes with a more or less distinct ridge running from apex; in some examples there appears to be a flattened margin. It is possible that they may be impressions of the sclerotesta of a species of *Trigonocarpus*. Adopting Seward's use of the term *Cordaicarpus* for "platyspermic seeds, preserved as casts or impressions, having a comparatively narrow border enclosing an ovate or cordate-ovate nucule", these impressions may for the present be included in this genus.

The figured specimen is No. 2034 in the collection of the Geology Department, University of Sydney.

CORDAICARPUS PROLATUS, n. sp. Pl. xix, fig. 6.

Nucule 9 mm. by 5 mm., with broad base, and narrowing to pointed apex. There is a short vertical ridge at the centre of the base which may be an indication of a vascular strand. There is some indication of a narrow sarcotesta or wing about 1 mm. wide.

Specimen 2035 gives some indication of the structure of the apex, suggesting a short micropyle leading to the pollen chamber.

The figured specimen is No. 2035 in the collection of the Geology Department, University of Sydney.

(b) Seeds from the Greta Coal Measures.

CORNUCARPUS STRIATUS, n. sp. Pl. xix, fig. 9.

Halle (1927) proposed to use the name *Cornucarpus* Arber as a general designation for platyspermic seeds with two horn-like projections at the apex. He defined the genus as "Platyspermic seeds, with or without wings, provided at the apex with two acute projecting horns, which are at least as long as they are broad, or more often longer".

With this general conception, a specimen from the Greta Coal Measures may well be referred to this genus. It is about 11 × 7 mm., ovate, without wings, apex acute divided by a narrow sinus about 2 mm. in length. The surface is

covered with a series of fine vertical striations. It seems to show closest resemblance to *Cornucarpus ? carinatus* Halle, except that it does not possess the marked keel and it is not emarginate at the base. In general appearance it is not unlike some specimens that have been described as scale-leaves of *Glossopteris*.

The figured specimen is No. 2038 in the collection of the Geology Department, University of Sydney.

CORDAICARPUS EMARGINATUS, n. sp. Pl. xix, fig. 11.

Seeds ovate, platyspermic, 6-8 mm. \times 4-5 mm., with slight emargination at apex.

No structure is preserved, but most of the impressions show fine vertical striations. The shallow emargination at the apex suggests the existence of a narrow wing, which is supported by the fact that a narrow marginal portion of the impression in some cases appears flat, the central area being slightly raised. These seeds are associated with *Noeggerathiopsis Hislopi*.

The figured specimen is No. 2039 in the collection of the Geology Department, University of Sydney.

(c) *Specimens from the Newcastle Coal Measures.*

? PITYOLEPIS SP. Pl. xix, fig. 12.

The name *Pityolepis* is one of a series proposed by Nathorst for specimens suggesting alliance with Abietineous genera—*Pityolepis* being used for cone-scales. Two specimens from the Newcastle Coal Measures (Permian) show such a resemblance to a cone-scale of *Pinus monophylla* bearing a single seed (see Seward, 1919, p. 119, fig. 686B) as to suggest the possibility that we may have here in rocks of Permian age some suggestion of the occurrence of a cone with Abietineous relations.

The specimens are rounded-oval in shape, about 10 by 7 mm. The central depression is about 5 by 8.5 mm., the flattened outer portion being about 1 mm. wide and decreasing in width towards the base. There is a series of vertical striations over the whole. The outer zone is not sufficiently distinct from the central portion to be regarded as a wing such as is characteristic of *Samaropsis*.

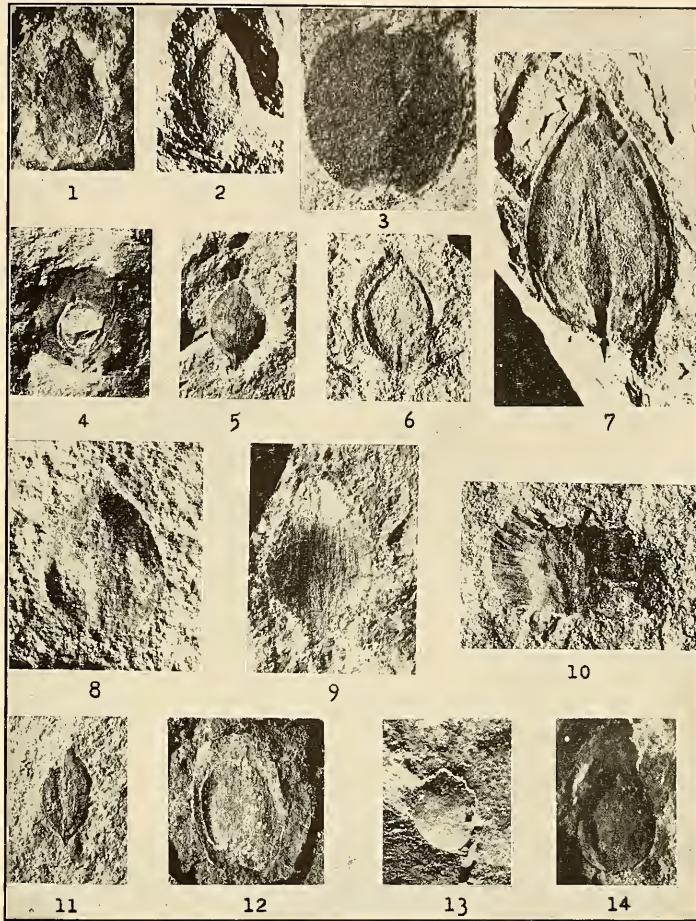
The figured specimen is No. 2040 in the collection of the Geology Department, University of Sydney.

SAMAROPSIS MORAVICA (?) (Helmhacher).

A specimen in the collection shows a close resemblance to one previously figured from the Newcastle Series at Belmont (Walkom, 1928, p. 562, fig. 10). The nucular portion is about 4 by 2 mm., and the whole, including the wing, about 6-7 mm. by 4.5 mm.

CARPOLITHUS CIRCULARIS, n. sp. Pl. xix, figs. 13, 14.

A series of small rounded, almost circular, flattened specimens, 2.5 to 3.5 mm. in diameter, are shown, by a more complete specimen, to represent the nucules of a species in which the sarcotesta is produced to an elongated apex. This specimen has a total length of about 4.5 mm., its nucule being 2.5 mm. in diameter. There is no indication of any structure or of the nature of the vascular strands, and it is therefore considered advisable to include it as a species of *Carpolithus* for the present.



Seeds from Upper Palaeozoic Rocks of the Werrie Basin.